APPENDIX I

GLOSSARY

AMPLIDYNE—A special dc generator in which a small dc voltage applied to field windings controls a large output voltage from the generator. In effect, an amplidyne is a rotary amplifier, oftentimes producing gain in the order of 10,000.

ARMATURE—The windings in which the output voltage is generated in a generator or in which input current creates a magnetic field that interacts with the main field in a motor. Note: Armature is often used as being identical with ROTOR. This usage is correct only part of the time. See the text and the entries under ROTOR and STATOR in this Glossary.

ARMATURE LOSSES—Copper losses, eddy current losses, hysteresis losses which act to decrease the efficiency of armatures.

ARMATURE REACTION—The effect, in a dc generator, of current in the annature creating a magnetic field that distorts the main field and causing a shift in the neutral plane.

BRUSHES—Sliding contacts, usually carbon, that make electrical connection to the rotating part of a motor or generator.

COMMUTATION—The act of a commutator in converting generator output from an ac voltage to a dc voltage.

COMMUTATOR—A mechanical device that reverses armature connections in motors and generators at the proper instant so that current continues to flow in only one direction. In effect, the commutator changes ac to dc.

COMPENSATING WINDINGS—Windings embedded in slots in pole pieces, connected in series with the armature, whose magnetic field opposes the armature field and cancels armature reaction.

COMPOUND-WOUND MOTORS AND GENERATORS—Machines that have a series field in addition to a shunt field. Such machines have characteristics of both series- and shunt-wound machines.

CAPACITOR-START MOTOR—A type of single-phase, ac induction motor in which a starting winding and a capacitor are placed in series to start the motor. The values of Xc and R are such that the main-winding and starting-winding currents are nearly 90 degrees apart, and starting torque is produced as in a two-phase motor.

COUNTER EMF—The voltage generated within a coil by a moving magnetic field cutting across the coil itself. This voltage is in opposition (counter) to the moving field that created it. Counter emf is present in every motor, generator, transformer, or other inductance winding, whenever an alternating current flows.

DELTA—A 3-phase connection in which windings are connected end-to-end, forming a closed loop that resembles the Greek letter Delta. A separate phase wire is then connected to each of the three junctions.

DRUM-TYPE ARMATURE—An efficient, popular type of armature designed so that the entire length of the winding is cutting the field at all times. Most wound armatures are of this type.

EDDY CURRENTS—Currents induced in the body of a conducting mass by a variation in magnetic flux.

FIELD—The electromagnet that furnishes the magnetic field that interacts with the armature in motors and generators.

FIELD EXCITATION—The creation of a steady magnetic field within the field windings by applying a dc voltage either from the generator itself or from an external source.

GENERATOR—A machine that converts mechanical energy to electrical energy by applying the principal of magnetic induction. A machine that produces ac or dc voltage, depending on the original design.

GRAMME-RING ARMATURE—An inefficient type of armature winding in which many of the turns are shielded from the field by its own iron ring.

INDUCTION MOTOR—A simple, rugged, ac motor with desirable characteristics. The rotor is energized by transformer action (induction) from the stator. More induction motors are used than any other type.

INTERPOLES—Small auxiliary poles placed between main field poles, whose magnetic field opposes the armature field and cancels armature reaction. Interpoles accomplish the same thing as compensating windings.

LAP WINDING—An armature winding in which opposite ends of each coil are connected to adjoining segments of the commutator so that the windings overlap.

LEFT-HAND RULE FOR GENERATORS—A representation of the relationships between motion, magnetic force, and resultant current in the generation of a voltage. The thumb, forefinger, and middle finger of the left hand are extended at right angles to each other. The thumb should point in the direction the conductor moves. The forefinger should point in the direction of magnetic flux from north to south. The middle finger will then point in the direction the generated voltage forces current to flow. Any of three quantities may be found if the other two are known.

MAGNETIC INDUCTION—The generation of a voltage in a circuit by causing relative motion between a magnetic field and the circuit. The relative motion can be the result of physical movement or the rise and fall of a magnetic field created by a changing current.

MOTOR—A machine that converts electrical energy to mechanical energy. It is activated by ac or dc voltage, depending on the design.

MOTOR LOAD—Any device driven by a motor. Typical loads are drills, saws, water pumps, rotating antennas, generators, etc. The speed and power capabilities of a motor must be matched to the speed and power requirements of the motor load.

MOTOR REACTION—The force created by generator armature current that tends to oppose normal rotation of the armature.

MOTOR STARTERS—Large resistive devices placed in series with dc motor armatures to prevent the armature from drawing excessive current until armature speed develops counter emf. The resistance is gradually removed from the circuit either automatically or manually as motor speed increases.

MULTIPHASE—See polyphase.

POLE PIECES—The shaped magnetic material upon which the stator windings of motors and generators are mounted or wound.

POLE—The sections of a field magnet where the flux lines are concentrated; also where they enter and leave the magnet.

POLYPHASE—Term that describes systems or units of a system that are activated by or which generate separate out-of-phase voltages. Typical polyphase systems are 2-phase and 3-phase whose voltages are 90- and 120-degrees out of phase, respectively. This term means the same as MULTIPHASE.

PRIME MOVER—The source of the turning force applied to the rotor of a generator. This may be an electric motor, a gasoline engine, steam turbine, etc.

ROTATING FIELD—The magnetic field in a multiphase ac motor that is the result of field windings being energized by out-of-phase voltages. In effect, the magnetic field is made to rotate electrically rather than mechanically.

ROTOR—The revolving part of a rotating electrical machine. The rotor may be either the field or the armature, depending on the design of the machine.

SELF-EXCITED GENERATORS—Dc generators in which the generator output is fed to the field to produce field excitation.

SERIES-WOUND MOTORS AND GENERATORS—Machines in which the armature and field windings are connected in series with each other.

SHUNT-WOUND MOTORS AND GENERATORS—Machines in which the armature and field windings are connected in parallel (shunt) with each other.

SLIP—The difference between rotor speed and synchronous speed in an ac induction motor. The rotor will always be slower than the synchronous speed by the amount of slip, otherwise, no voltage would be induced in the rotor.

SLIP RINGS—Contacts that are mounted on the shaft of a motor or generator to which the rotor windings are connected, and against which the brushes ride.

SQUIRREL-CAGE WINDINGS—A type of rotor winding in which heavy conductors are imbedded in the rotor body. The conductors are shorted together at the ends by continuous rings. No insulation is required between the windings and the core. This type of winding is rugged, easily manufactured, and practically maintenance free. It is widely applied in ac induction motors. Physically, it appears as a rotating squirrel-cage, thus the name.

STATOR—The stationary part of a rotating electrical machine. The stator may be either the field or the armature, depending on the design of the machine.

SYNCHRONOUS MOTOR—An ac motor whose rotor is activated by dc. It is characterized by constant speed and requires squirrel-cage windings or some other method to be self-starting.

SYNCHRONOUS SPEED—The speed at which the rotating field in an ac motor revolves. This speed is a function of the number of poles in the field and the frequency of the applied voltage.

VOLTAGE REGULATION—A measure of the ability of a generator to maintain a constant output voltage from no-load to full-load operation. Expressed as a percentage of full-load voltage, the better the regulation, the lower the percent.

WAVE WINDING—An armature winding in which the two ends of each coil are connected to commutator segments separated by the distance between poles. The winding goes successively under each main pole before reaching the starting point again.

WYE (Y)—A 3-phase connection in which one end of each phase winding is connected to a common point. Each free end is connected to a separate phase wire. The diagram of this connection often resembles the letter Y.

MODULE 5 INDEX

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